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A Simple Model of Coevolution for Macroscopic and Microscopic Levels

Abstract:

In Thomas Schelling's famous segregation model, it is shown that the link between the individual characteristics of agents (micro) and the global states of the system (macro) is not trivial. We recently studied this model using statistical physics tools [1], showing for the first time that an analytical link between these two levels, characteristics of agents (utility function) and global structures of segregation, can be established.

This work aims to build a similar conceptual model, but includes an important sociological ingredient: the evolution of individual characteristics. Economic models have often been subject to criticism (by sociologists, mainly) about their arbitrary and static set of individual characteristics. Of course, one could object: any simulation in which, by construction, agents always follow programmatically predetermined rules cannot be of great interest for a sociology concerned about the real world. However, we believe it may be worthwhile to build a model of a virtual society, and to accept its simplicity, to help us better consider the evolving characteristics of the agents, and to understand better the interplay between micro and macro levels.

We start from the standard segregation model and build up by adding a simple co-evolution mechanism of micro and macro levels. More specifically, we add a feedback mechanism linking the agents' interactions and their individual characteristics. This will result in changes in both the microscopic and macroscopic states.

The objectives are twofold: (1) precisely determining how to couple agents and (2) to study the co-evolution of preferences and global states to identify possible stationary states (at both levels).

References

[1] Grauwin, Sébastian, et al. (2009) “Competition between collective and individual dynamics.” Proceedings of the National Academy of Sciences vol. 106, n. 49, pp. 20622-20626.

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